WORLD METEOROLOGICAL ORGANIZATION
_____

JOINT MEETING OF
CBS EXPERT TEAM ON SURFACE-BASED REMOTELY-SENSED OBSERVATIONS
(Second Session)
AND
CIMO EXPERT TEAM ON OPERATIONAL REMOTE-SENSING
(First Session)
GENEVA, SWITZERLAND, 5- 9 DECEMBER 2011)

CBS/ET-SBRSO-2 & CIMO/ET-ORS-1/Doc.3.4.2

(15.XI.2011)
_____

ITEM : 3.4

Original: ENGLISH ONLY

WEATHER RADAR OPERATIONS, STATUS, ISSUES, REQUIREMENTS FOR DATA EXCHANGE AND PLANS

Quality Control Issues

Radar at high altitude sites

(Submitted by Li Bai, China Meteorological Administration)

SUMMARY AND PURPOSE OF DOCUMENT

The paper discusses the new volume scan strategy(VCP22) used in radar at high altitude sites

---

1) The deployment and coverage of weather radar in China

Currently more than 160 radars have been built in China. As for future plan, in total, 216 weather radars will be built. The weather radars have played an important role in monitoring and warning typhoon, rainstorm, hail and so on.

Now, S-band (2700MHz ~ 2900MHz) radars are mainly distributed in the south and coastal regions, while C-band (5300MHz ~ 5500MHz) radars are mainly located in the north and the west. According to the statistics of 2010, the numbers of two types are 91(S) and 73(C) respectively. (Fig.1 indicates network coverage of the whole country, Fig.2 shows coverage area in east coast of country.)

But still many challenges are faced in operation, e.g., interference, beam blocked which result from high buildings or mountains, lack of low level observation(especially the radar at high altitude sites) and so on.

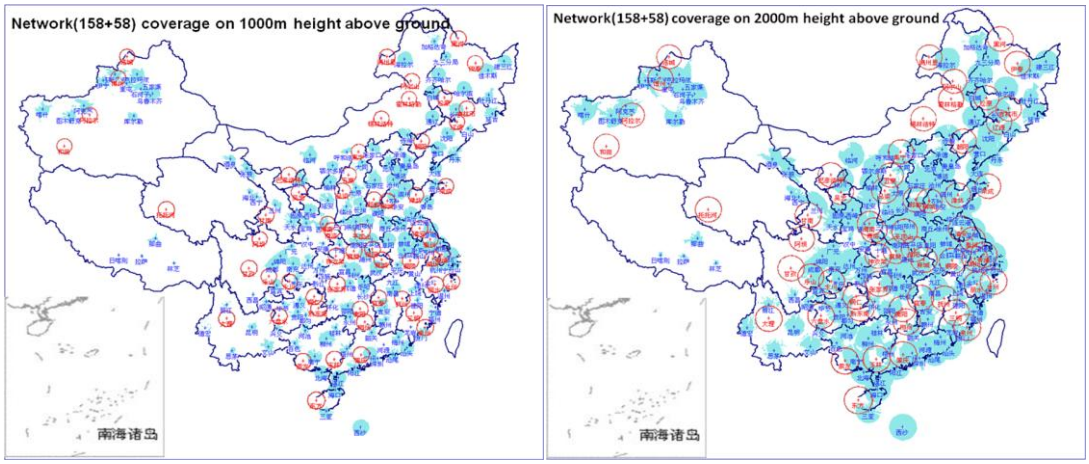

Fig.1. Network coverage（1000m and 2000m above ground）

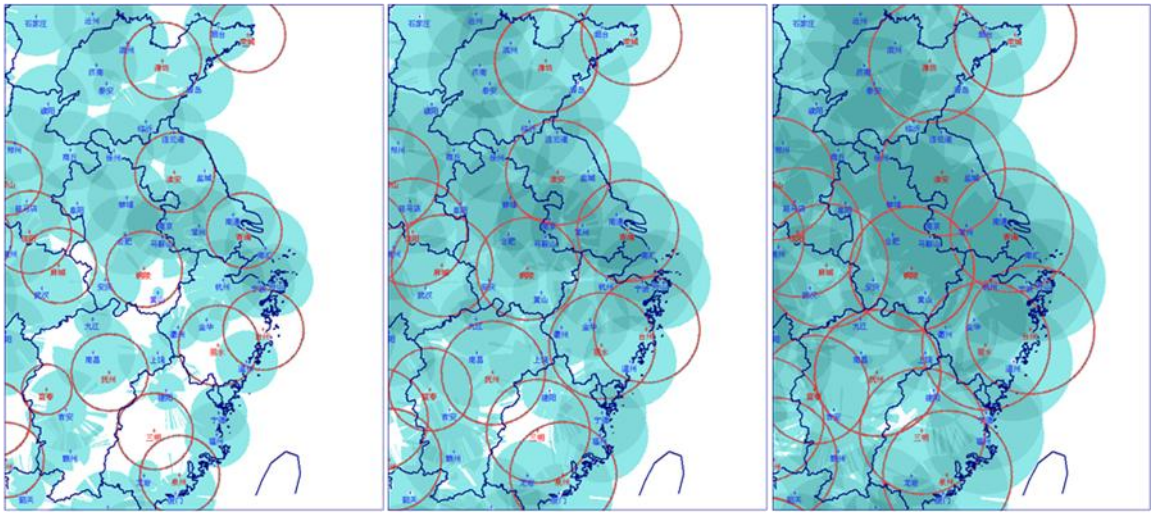

Fig. 2 Coverage area of east coast

2) The distribution of radar at high altitude sites

As shown in Fig.1 and Fig.2, some gaps can be found below 3000m height above sea level). The results show that some radars, especially in the west, low level observation is so limited that the weather system in mid or low level cannot be well observed. To be more specific, in China, about 27 sites locate in high altitude of more than 1.5 kilometers, e.g., HuangShan, TaiShan and LongYan.

3) The new volume scan strategy — VCP22

Due to the high altitude, it is necessary to change volume scan strategy among these sites. Compared with previous VCP21, the new strategy named VCP22 has applied 0° or negative elevation to compensate the low level observation. Table 1 and Table 2 show the elevations and modes of VCP21 and VCP22. In ChangLe site, there are 2 new elevation angles(-0.3° and 0°) added into the new strategy while 2 existed elevation angles(14.6° and 19.5°) cancelled at the same time. Meanwhile, as for Longyan site, all the elevation angles have been subtracted by 0.5° in order to improve low level observation capability. Fig.3 and Fig.4 show comparisons of ray paths between VCP21 and

VCP22.

We have chosen two sites (ChangLe and LongYan, which are coastal areas in FuJian province) to do the experiments to test the new strategy.

Table 1 VCP21 / VCP22 in ChangLe site

VCP21		VCP22	
Elevation	Mode	Elevation	Mode
0.5	CS/CD	-0.3	CS/CD
1.45		0	
2.4	B	0.49	
3.35		1.45	
4.3		2.4	B
6	CDX	3.35	
9.9		4.3	
14.6		6	CDX
19.5		9.9	

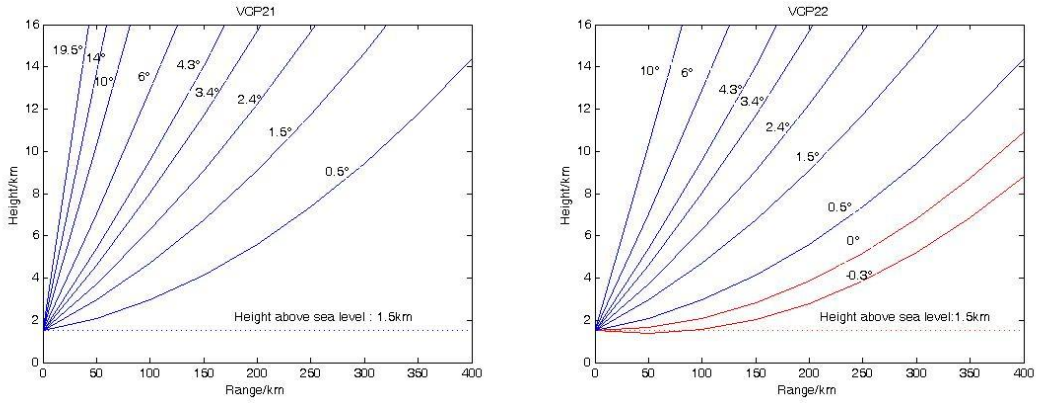

Fig.3 Ray paths—VCP21(left) and VCP22(right) in ChangLe site

Table 2 VCP21 / VCP22 in LongYan site

VCP21		VCP22	
Elevation	Mode	Elevation	Mode
0.5	CS/CD	0	CS/CD
1.45		0.95	
2.4	B	1.9	B
3.35		2.85	
4.3		3.8	
6	CDX	5.5	CDX
9.9		9.4	
14.6		14.1	
19.5		19	

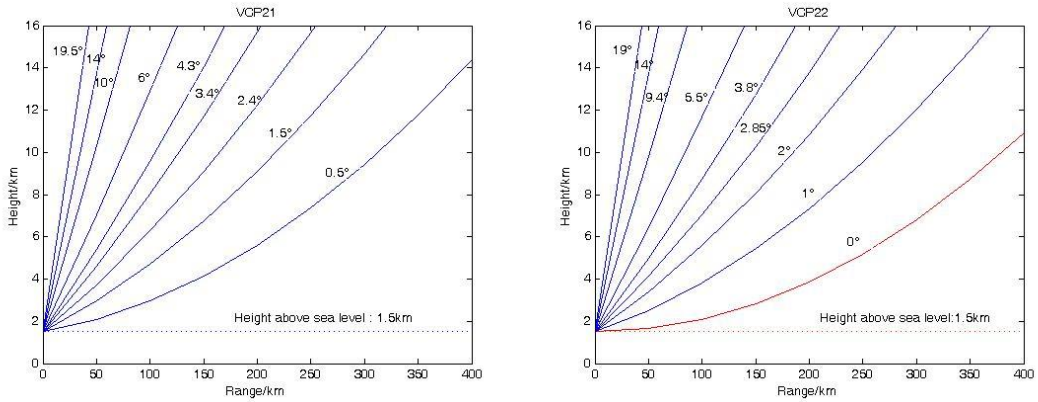

Fig.4 Ray paths—VCP21(left) and VCP22(right) in LongYan site

4) Test

Fig.5 and Fig.6 are examples of comparison between VCP21 and VCP22 in ChangLe and LongYan sites. Obviously, low level observation is improved (enlarged range, strengthened reflectivity and farther precipitation echo observation ability) by use of VCP22. The test results show that the new strategy will bring much benefit for monitoring severe weather, like typhoon, rainstorm and so on.

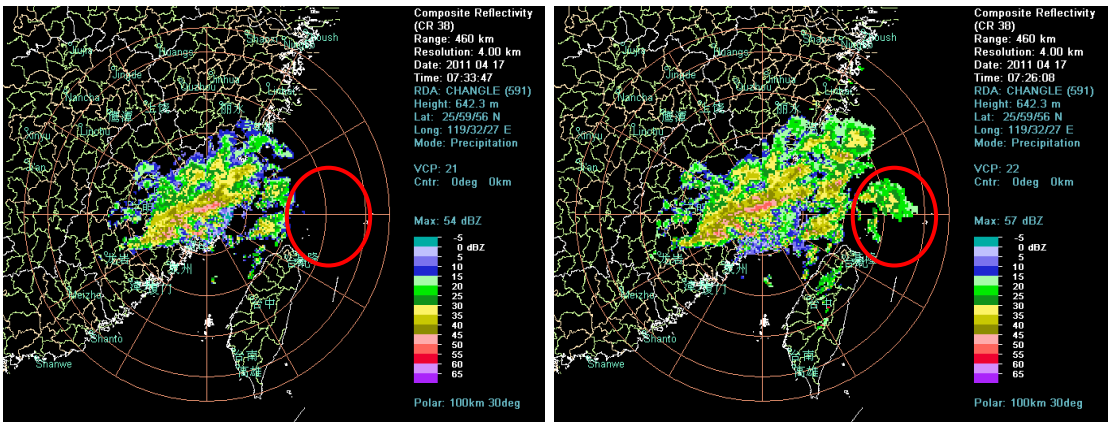

Fig.5 Composite Reflecitivity of VCP21(left) and VCP22(right) in ChangLe site

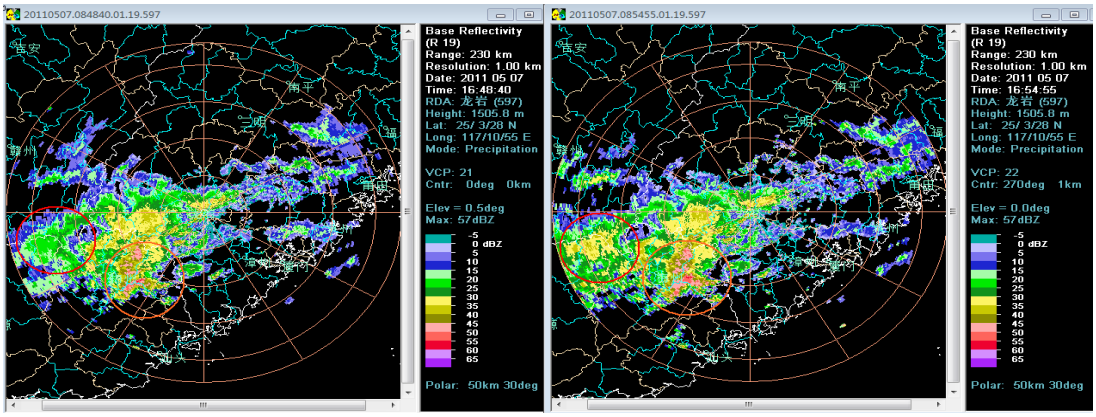

Fig.6 Base Reflecitivity of VCP21(left) and VCP22(right) in LongYan site

But this scheme also brings disadvantages :

(1) Ground clutter is significantly increased by use of VCP22, as shown in Fig.7.

(2) Wave clutter occurred after use of VCP22, as shown in Fig.8, 00:44:24(UTC), 30th August 2011 during typhoon “Nanmad”.

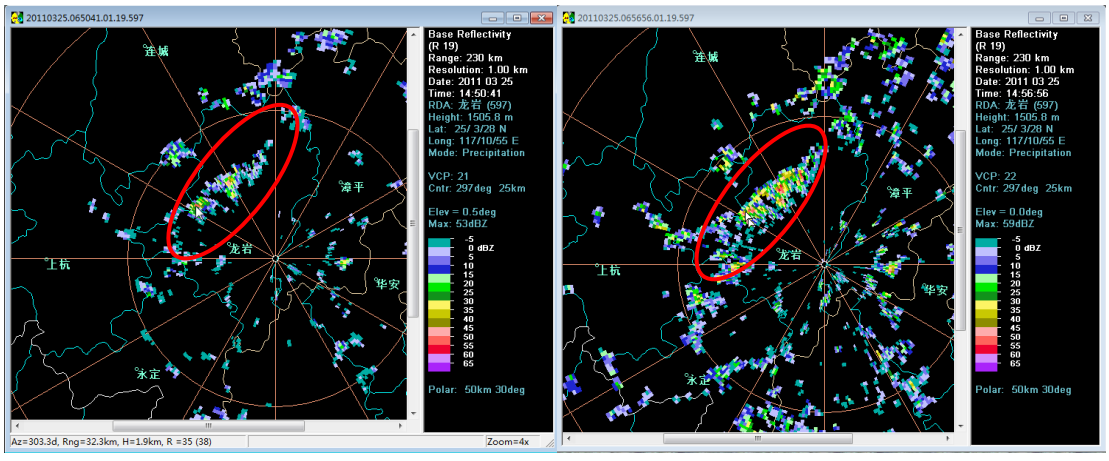

Fig.7 Comparison of Ground Clutter, VCP21(left) and VCP22(right)

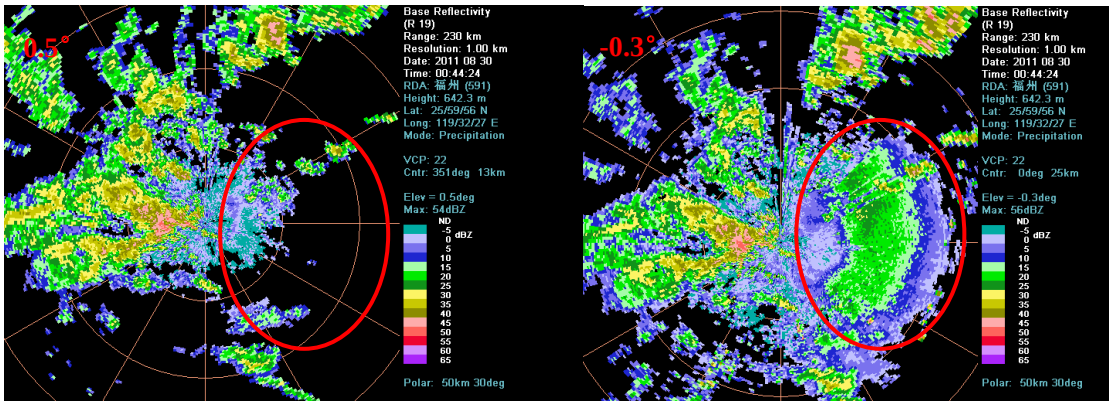

Fig.8 The wave clutter in -0.3° elevation(right) in Fuzhou site

5) Recommendation

The goal of the new volume scan strategy(VCP22) in high altitude sites is to improve the capability of the mesoscale weather system monitoring.

But the new strategy also brings negative effects: the Ground clutter is increased and intensified, and sometimes the wave clutter is occured. In this session, we will focus on how to solve this issue, i.e., more quality control should be done to remove the Ground and wave clutter.